

Abundance and Diversity of Bumblebees and Cuckoo Bees in a Suburban Garden

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For six consecutive years (1972-1977), I operated a Malaise trap in my garden in the suburbs of Leicester. The trap was set up to monitor the abundance and diversity of selected groups of insects, including hoverflies, ladybirds and moths, and is part of a wider study of the ecology of gardens. During the period of operation, 3,519 bumblebees and six cuckoo bees were trapped and in this paper I tabulate the species and discuss fluctuations in numbers.

The Malaise trap (named after its inventor) is an open-sided, tent-like construction of fine netting with an internal baffle of netting, supported by poles and strings. Flying insects that wander into the trap tend to fly upwards on encountering the central baffle and eventually fall into a plastic jar containing 70% alcohol attached at the apex. The trap's suitability for sampling flying insects depends on two features: no attractant is used, the only insects caught being those that fly into it of their own accord; and it can be operated continuously in all weather throughout the year. All insects that fall into the jar are of course killed, but the effect of the trap on the garden fauna is negligible because it samples an area of only 2.6 square metres to a height of 1.1 metres. A colour picture of a Malaise trap set in the Leicester garden is reproduced in Owen (1978).

The garden was laid out about fifty years ago and is therefore mature and well-established. It occupies an area of 658 square metres and is located at a corner of a busy road only 3.8 kilometres from the centre of the city. There are open fields about 800 metres away, a small stream flanked by tall trees within 125 metres, and two wooded parks within a radius of 450 metres. Like other gardens in the area it is a mosaic of open spaces and shade. There are well-trimmed lawns and herbaceous borders, patches set aside for growing vegetables, a compost heap, fruit bushes, an old apple tree, a rock-garden, and many shrubs of a variety of species. In 1975-77, 282 species of flowering plants belonging to 72 families were recorded in the garden, about half of them native and half introduced. Many of the flowers are extremely attractive to nectar-feeding insects and there is no doubt that the garden is good for bees: besides the species discussed in this paper a large variety of solitary species is present and a list is currently being compiled.

Table 1 shows the numbers of bumblebees and cuckoo bees taken in the Malaise trap in 1972-1977. Species were identified by Dr. Jennifer Owen using the keys in Alford (1973) and Free and Butler (1968), and in some instances by comparison with named specimens. As shown, the total number of bees trapped varied from year to year: 1977 was the best year with twice as many individuals as in 1972, the

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poorest year. Only six cuckoo bees, *Psithyrus*, were recorded, but four of the six British species are represented. Trapping thus confirms that these social parasites of bumblebees are relatively rare. Eight of the 20 British species of *Bombus* were recorded. Every year the commonest was *B. agrorum* (= *pascuorum*) which made up 46% of the total sample. Another three species, *B. terrestris*, *B. pratorum* and *B. hortorum*, could be described as common, while the remaining species, *B. ruderarius*, *B. lapidarius*, *B. ruderatus* and *B. lucorum*, could all be described as moderately common. No rare or unusual species were found in the 3,519 *Bombus* examined.

The Malaise trap also provided quantitative information on seasonality. In five of the six years, the peak of overall abundance occurred in June; 1973 was exceptional with a peak in August. In 1976, the year of severe summer drought, bumblebees became relatively scarce from August onwards, but as shown in Table 1 numbers were neither especially high nor low. The trap records confirmed that *B. terrestris* queens are the first to emerge from hibernation, and that *B. pratorum* produces males earlier in the season than the other species.

Trapping has thus provided a numerical estimate of abundance; moreover if had not used a trap I would not have recorded the four species of *Psithyrus*, because despite careful searching these have never been seen alive in the garden. Observations suggest that the flowers of sage, *Salvia officinalis*, are the most attractive to *Bombus*, and that the flowers of raspberry, *Rubus idaeus*, blackberry, *Rubus* ssp., spotted dead nettle, *Lamium maculatum*, buddleia, *Buddleia davidii*, hollyhock, *Althaea rosea*, and bellflower, *Campanula* spp., are also extremely attractive.

TABLE 1. Frequency of bumblebees and cuckoo bees caught in a Malaise trap in a Leicester garden during six consecutive seasons.

	1972	1973	1974	1975	1976	1977	Total
<i>Bombus agrorum</i> F.	171	512	360	163	196	208	1610
<i>ruderarius</i> Müller	15	11	17	28	13	8	92
<i>lapidarius</i> L.	13	5	9	9	41	24	101
<i>terrestris</i> L.	48	62	89	93	47	96	435
<i>ruderatus</i> F.	—	8	15	5	6	52	86
<i>lucorum</i> L.	69	19	38	28	24	69	247
<i>pratorum</i> L.	39	46	91	48	103	173	500
<i>hortorum</i> L.	34	56	81	90	44	143	448
<i>Psithyrus rupestris</i> F.	—	—	—	—	—	1	1
<i>vestalis</i> Geoffroy	—	—	1	—	1	—	2
<i>sylvestris</i> Lepeletier	—	—	—	1	1	—	2
<i>campestris</i> Panzer	—	—	1	—	—	—	1
Total	389	719	702	465	476	774	3525

Malaise traps have now been erected in other gardens and it should eventually be possible to make comparisons with the Leicester garden. It will also be possible to present

numerical information on the solitary bees once the appropriate taxonomic work has been completed.

References

- Alford, D. V. 1973. *Bumblebee distribution maps scheme: guide to the British species*. Bee Research Association, London.
 Free, J. B. and Butler, C. G. 1968. *Bumblebees*. Collins, London.
 Owen, D. 1978. *The natural history of Britain and Northern Europe: Towns and gardens*. Hodder & Stoughton, London.

AN UNUSUAL PUPATION SITE. — Being in quest of tineid records from the county, I made arrangements last winter with some of the wardens of the Essex Naturalists' Trust reserves to receive the contents of their nesting boxes when they cleared them out for the new season. A nest from Birch Wood, Little Baddow produced, besides tineids, no fewer than 16 specimens of *Ectoedemia argentipedella* (Zeller) (Lep.: Nepticulidae), which emerged from the 13th of May to the 2nd of June. For one nepticulid to have found its way into the nesting box would be interesting: for 16 to have done so is quite extraordinary; moreover, these were probably the survivors of two or three times that number, when parasites and normal mortality are allowed for. The nesting box was attached to or adjacent to a birch (the larval foodplant), since plenty of birch seed had found its way in amongst the nesting material. The larvae must have been feeding high in the tree, since these boxes are generally sited ten or more feet from the ground and they would hardly have climbed the tree to reach the nest. They must have walked there, as it is unreasonable to suppose that so many larvae, each having mined a different leaf would have all chanced to descend upon the same spot on their silken threads. When you consider that the line you are reading would easily accommodate 50 such larvae placed head to tail, you will appreciate the immense journey they must have undertaken. For them to converge on the nest, they must have been attracted to it, presumably by scent. It is remarkable that a larva, which has spent its life between the cuticles of a birch-leaf, should have a sense of smell capable of detecting a bird's nest from afar; furthermore, that it should associate the smell with a good pupation site. A nest is, in fact, not dissimilar from the sphagnum I would have provided for them in captivity.

In MBGBI 1:174-5 I wrote of the Nepticulidae, "Except for a few species, it is hard to know what site is selected for pupation in the wild. . . . The chances of these specks being detected by a collector are remote." The incident I have narrated is unprecedented in my experience. — A. M. EMMET, Labrey Cottage, Victoria Gardens, Saffron Walden, Essex, 18.vi.1978.

CORRECTION

Reference "Winter Activity" by J. Cooter (*antea* 90: 115), in line one insert "final" after "three", and in line four for "Capsie" read "Campsie".